

WHAT IS CLAIMED IS

1. An enzyme which has an activity to deamidate amido groups in a protein.

2. An enzyme which has an activity to deamidate amido groups in a protein by directly acting upon the amido groups without cutting peptide bonds and without crosslinking a protein.

3. The enzyme as claimed in claim 1 or 2, wherein said enzyme is derived from a microorganism.

4. A polypeptide which comprises a polypeptide having an activity to deamidate amido groups in protein and having the amino acid sequence of SEQUENCE NO. 6 shown in the Sequence Listing, wherein one or more of amino acid residues of the amino acid sequence may be modified by at least one of deletion, addition, insertion and substitution.

5. A polypeptide which comprises a polypeptide having the amino acid sequence of SEQUENCE NO. 6 shown in the Sequence Listing.

6. A nucleotide which encodes a polypeptide having an activity to deamidate amido groups in protein.

7. A nucleotide which encodes a polypeptide having an activity to deamidate amido groups in protein by directly acting upon the amido groups without cutting peptide bonds and without cross-linking a protein.

8. A nucleotide which comprises a nucleotide being selected from the following nucleotides (a) to (g) and encoding a polypeptide having an activity to deamidate amido groups in protein;

(a) a nucleotide which encode a polypeptide having the amino acid sequence of SEQUENCE NO. 6 shown in the Sequence Listing,

(b) a nucleotide which encodes a polypeptide having the amino acid sequence of SEQUENCE NO. 6 shown in the Sequence Listing, wherein one or more amino acid residues of the amino acid sequence are modified by at least one of deletion, addition, insertion and substitution,

(c) a nucleotide which has the nucleotide sequence of SEQUENCE NO. 5 shown in the Sequence Listing,

(d) a nucleotide which has the nucleotide sequence of SEQUENCE NO. 5 shown in the Sequence Listing, wherein one or more bases of the nucleotide sequence are modified by at least one of deletion, addition, insertion and substitution,

(e) a nucleotide which hybridizes with any one of the aforementioned nucleotides (a) to (d) under a stringent condition,

(f) a nucleotide which has homology with any one of the aforementioned nucleotides (a) to (d), and

(g) a nucleotide which is degenerate with respect to any one of the aforementioned nucleotides (a) to (f).

9. A nucleotide which comprises a nucleotide encoding a polypeptide having the amino acid sequence SEQUENCE NO. 6 shown in the Sequence Listing.

10. A recombinant vector which contains the nucleotide of any one of claims 6 to 9.

11. A transformant transformed with the recombinant vector of claim 10.

12. A method for producing an enzyme having an action to deamidate amido groups in protein, which comprises culturing the transformant of claim 11, thereby allowing said transformant to produce an enzyme having an activity to deamidate amido groups in protein, and subsequently collecting the enzyme having an activity to deamidate amido groups in protein from the culture mixture.

13. A recombinant polypeptide having an action to deamidate amido groups in protein, which is obtained by the method of claim 11 by culturing the transformant and collecting the polypeptide from said culture mixture.

14. A method for producing a novel enzyme, which comprises culturing a microorganism in a nutrient medium, thereby allowing said microorganism to produce a novel enzyme having an activity to deamidate amido groups in protein, and subsequently collecting said enzyme.

15. A method for producing a novel enzyme having an activity to deamidate amido groups in protein, which comprises culturing a microorganism in a nutrient medium, thereby allowing the microorganism to produce a novel enzyme which has an activity to deamidate amido groups in protein by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein, and subsequently collecting said enzyme.

16. The production process according to claim 14 or 15, wherein the microorganism is a bacterium belonging to Cytophagales or Actinomycetes.

17. The production process according to claim 14 or 15, wherein the microorganism is a bacterium belonging to Flavobacteriaceae.

18. The production process according to claim 14 or 15, wherein the microorganism belonging to the genus selected from the group consisting of Chryseobacterium, Flavobacterium, Empedobacter, Sphingobacterium, Aureobacterium and Myroides.

19. The production process according to claim 14 or 15, wherein the microorganism belonging to the genus Chryseobacterium.

20. The production process according to claim 14 or 15, wherein the microorganism is a strain Chryseobacterium sp. No. 9670 (FERM BP-7351).

21. A method for modifying a protein or a peptide, which comprises allowing an enzyme having an activity to deamidate amido groups in protein or peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein to react with a protein or a peptide.

22. A composition for use in modification of a protein or a peptide, which comprises an enzyme having an activity to deamidate amido groups in protein or

peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein, as the active ingredient.

23. An isolated microorganism *Chryseobacterium* sp. No. 9670 (FERM BP-7351).

24. A method for improving functionality of a plant or animal protein and/or peptide, which comprises allowing an enzyme having an activity to deamidate amido groups in protein and peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein to react with the protein and/or peptide.

25. A method for improving functionality of food containing a plant or animal protein and/or peptide, which comprises allowing an enzyme having an activity to deamidate amido groups in protein and peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein to react with the food.

26. An enzyme which has an activity to deamidate amido groups in a protein.

27. An enzyme which has an activity to deamidate amido groups in a protein by directly acting upon the amido groups without cutting peptide bonds and without cross-linking a protein.

28. The enzyme as claimed in claim 26 or 27, wherein said enzyme is derived from a microorganism.

29. A polypeptide which comprises a polypeptide having an activity to deamidate amido groups in protein and having the amino acid sequence of SEQ ID NO:6, wherein one or more of amino acid residues of the amino acid sequence may be modified by at least one of deletion, addition, insertion and substitution.

30. A polypeptide which comprises a polypeptide having the amino acid sequence of SEQ ID NO:6.

31. A recombinant polypeptide having an action to deamidate amido groups in protein, which is obtained by culturing a transformant transformed with a recombinant vector, which contains a nucleotide selected from the group consisting of:

a) a nucleotide which encodes a polypeptide having an activity to deamidate amido groups in protein,

b) a nucleotide which encodes a polypeptide

having an activity to deamidate amido groups in protein by directly acting upon the amido groups without cutting peptide bonds and without cross-linking a protein,

c) a nucleotide which comprises a nucleotide being selected from the following nucleotides (i) to (vii) and encoding a polypeptide having an activity to deamidate amido groups in protein;

(i) a nucleotide which encode a polypeptide having the amino acid sequence of SEQ ID NO:6,

(ii) a nucleotide which encodes a polypeptide having the amino acid sequence of SEQ ID NO:6, wherein one or more amino acid residues of the amino acid sequence are modified by at least one of deletion, addition, insertion and substitution,

(iii) a nucleotide which has the nucleotide sequence of SEQ ID NO:5,

(iv) a nucleotide which has the nucleotide sequence of SEQ ID NO:5, wherein one or more bases of the nucleotide sequence are modified by at least one of deletion, addition, insertion and substitution,

(v) a nucleotide which hybridizes with any one of the aforementioned nucleotides (i) to (iv) under a stringent condition,

(vi) a nucleotide which has homology with any one of the aforementioned nucleotides (i) to (iv), and



(vii) a nucleotide which is degenerate with respect to any one of the aforementioned nucleotides (i) to (vi), and

d) a nucleotide which comprises a nucleotide encoding a polypeptide having the amino acid sequence SEQ ID NO:6,

thereby allowing said transformant to produce an enzyme having an activity to deamidate amido groups in protein, and subsequently collecting the enzyme having an activity to deamidate amido groups in protein from the culture mixture.

32. A method for producing a novel enzyme, which comprises culturing a microorganism in a nutrient medium, thereby allowing said microorganism to produce a novel enzyme having an activity to deamidate amido groups in protein, and subsequently collecting said enzyme.

33. A method for producing a novel enzyme having an activity to deamidate amido groups in protein, which comprises culturing a microorganism in a nutrient medium, thereby allowing the microorganism to produce a novel enzyme which has an activity to deamidate amido groups in protein by directly acting upon the groups without causing severing of peptide bond and cross-

linking of protein, and subsequently collecting said enzyme.

34. The method according to claim 32 or 33, wherein the microorganism is a bacterium belonging to *Cytophagales* or *Actinomycetes*.

35. The method according to claim 32 or 33, wherein the microorganism is a bacterium belonging to *Flavobacteriaceae*.

36. The method according to claim 32 or 33, wherein the microorganism belonging to the genus selected from the group consisting of *Chryseobacterium*, *Flavobacterium*, *Empedobacter*, *Sphingobacterium*, *Aureobacterium* and *Myroides*.

37. The method according to claim 32 or 33, wherein the microorganism belonging to the genus *Chryseobacterium*.

38. The method according to claim 32 or 33, wherein the microorganism is a strain *Chryseobacterium* sp. No. 9670 (FERM BP-7351).

39. A composition for use in modification of a protein or a peptide, which comprises an enzyme having an activity to deamidate amido groups in protein or

peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein, as the active ingredient.